

Responses to Anonymous Referee #2

We thank referee #2 for reviewing and commenting on the manuscript. This valuable feedback was carefully taken into account to improve the quality of the paper.

Below, Referee #2 comments are marked in **red**.

Responses to the comments are marked in **blue**.

Changes made in the manuscript are marked in *italic*.

Minor comments:

My only recommendation is that an additional analysis/discussion be provided showing the uncertainties of input datasets, methods, and final results.

Some elements were already provided in the paper regarding the uncertainty of the input datasets, methods and final results. They are reported below and we further elaborated on them in the revised version of the manuscript

1. Input datasets:
 - a. Input AGB maps: The previous version of the paper specified that the general uncertainty of the CCI AGB maps reflected the combination of the standard deviations from the input data, the modelling algorithms and the merging procedure and lied below 15% of the AGB value for most aggregated 25km pixels (l 131 -135).
We provided some specific numbers regarding averaged uncertainties for low and high AGB (lines 133).
 - b. Input VOD: The uncertainty (i.e. VOD DQX, from Data Quality Index) is presented at lines 99-101. For more precision, we added some orders of magnitude of the VOD dqx, i.e. [0.01-0.06] for VOD between 0 and 0.6, and [0.2-0.25] for VOD higher than 1.2
2. Methods: The uncertainty of the method is thoroughly detailed lines 220-230 and further discussed lines 304-307. Fig. 9 presents the evaluation of the method uncertainty, which is found to be small compared to the spatial bias of the final result.
3. Final results: The uncertainty of the final result is presented lines 231-237 with Fig. 4 and is further discussed lines 307-311 with Fig. 8.

Modifications:

- *lines 93, we added information on the input data "VOD" such as: It translates how the radiometric TB noise propagates through the retrieval model, and constitutes the lower bound of the uncertainty. It is of [0.02-0.06] for VOD between 0 and 0.6, is higher, within the range [0.2-0.25] for VOD higher than 1.2.*
- *lines 231-233 were moved up lines 133-135 for more consistency.*

Here are my concerns about this manuscript:

1. **The section of Abstract is too lengthy now, which should be written in a pithy style, with some specific quantitative results.**

Thanks for this comment. We have shortened the abstract by 4 lines (16 lines in the new version vs 20 in the previous one), and rephrased sentences to make the abstract straight to the point. Main results were also added, i.e. values of the Pearson correlation coefficient between our AGB estimates and the CCI AGB to quantify the consistency of our work.

Modifications:

Abstract from lines 1 to 16 has been shortened.

2. The logical structure of the manuscript is somewhat confusing, such as the methods and results section. It is recommended to consult an expert for further polishing.

After discussion with our expert Yann Kerr (41753 citations, h-index 98 according to Google Scholars, Web Of Science Highly Cited Researcher in 2023/2022/2021/2020/2019/2015), we have divided the “Method” in three sections. The “results” section was rearranged to make it more consistent with the “method” section. The manuscript is then organized as follows:

The Method section is now divided into:

- 1- Converting VOD to AGB
- 2- Uncertainty estimation
- 3- AGB estimate evaluation and temporal analysis

The Result section is now divided into:

- 1- Converting VOD to AGB
- 2- Uncertainty estimation
- 3- Temporal analysis

The explanations remain unchanged, only the sectioning is different. We have decided to present the uncertainty estimation before the temporal analysis whereas it was the other way around in the previous version.

Modifications:

Added subsections lines 158, 217, 238 and 248.

We moved the uncertainty estimation part above the temporal analysis part in both the Method and result section.

3. In Discussion section, please give evidence to support these findings in the manuscript.

We were not sure how to address this comment, considering that the manuscript was well received by the reviewer (quality criteria excellent).

The discussion deals with many points of the method and results. Each point was discussed as a paragraph, and the discussed topics were supported with results, either as table, or statistical numbers. We also referred to published papers to support some comments.

4. In Conclusion section, the cited references should be deleted. Meanwhile, give some specific numbers to conclude the research results

We have deleted the two references in the conclusion and added the main results and their specific numbers.

Modifications:

- Deleted references lines 417 and 418

- *Added specific numbers lines 418-418, 422, 423, 427*